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AIR DEFENSE OF THE SOVIET MOTORIZED RIFLE BATTALION IN COMBAT.(U)  
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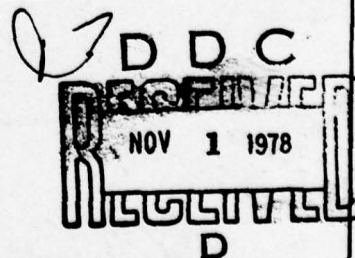
AIR DEFENSE OF THE  
SOVIET MOTORIZED RIFLE BATTALION  
IN COMBAT  
-1978-

GARMISCH, GERMANY

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## FOREWORD

This research project represents fulfillment of a student requirement for successful completion of the overseas phase of training of the Department of the Army's Foreign Area Officer Program (Russian).

Only unclassified sources are used in producing the research paper. The opinions, value judgements and conclusions expressed are those of the author and in no way reflect official policy of the United States Government; Department of Defense; Department of the Army; Office of the Assistant Chief of Staff of Intelligence; or the United States Army Institute for Advanced Russian and East European Studies.

Interested readers are invited to send their comments to the Commander of the Institute.



ROLAND LAJOTTE  
LTC, MI  
Commander

## TABLE OF CONTENTS

	Page
FOREWORD.....	11
LIST OF FIGURES.....	iv
CHAPTER	
I. INTRODUCTION.....	1
AIR DEFENSE ORDER OF BATTLE.....	3
SOVIET PHILOSOPHY OF AIR DEFENSE.....	8
ORGANIZATION OF THE MOTORIZED RIFLE BATTALION FOR AIR DEFENSE.....	10
II. AIR DEFENSE OF THE MOTORIZED RIFLE BATTALION IN THE OFFENSE..	11
THE ATTACK FROM THE MARCH.....	11
AIR DEFENSE IN THE WAITING AREA.....	12
AIR DEFENSE ON THE MARCH ROUTE.....	18
AIR DEFENSE DURING THE ASSAULT.....	23
THE ATTACK FROM POSITIONS IN DIRECT CONTACT WITH THE ENEMY.....	26
III. AIR DEFENSE OF THE MOTORIZED RIFLE BATTALION IN THE DEFENSE..	26
IV. AIR DEFENSE DURING RIVER CROSSING OPERATIONS.....	29
V. SUMMARY AND CONCLUSIONS.....	32
SELECTED BIBLIOGRAPHY.....	34

# LIST OF FIGURES

Figure	Page
1. Type Army Air Defense Envelope.....	4
2. SAM Air Defenses of a Type Soviet Army (3-4 Divisions) Advancing on a Front of 50 km. with a Depth of 100 km.....	5
3. Air Defense of a Motorized Rifle Battalion in the Waiting Area (Variant).....	14
4. Air Defense of a Motorized Rifle Battalion in the Waiting Area (Variant).....	15
4a. Air Defense of a Motorized Rifle Battalion in the Waiting Area (Variant).....	16
5. Air Defense of a Motorized Rifle Battalion in March Column.....	17
6. Air Defense of a Motorized Rifle Battalion in Approach March Column .....	22
7. Air Defense of a Motorized Rifle Battalion in a Mounted Assault.....	24
8. Air Defense of a Motorized Rifle Battalion in the Defense.....	30

## CHAPTER I

### INTRODUCTION

Until recently, Western military planners could with a high degree of confidence expect to be victorious in the asymmetrical struggle in Central Europe between NATO tactical air power and Soviet defensive means. This confidence was reinforced by the experience of the successful U.S. tactical air operations over North Vietnam in the late 1960's.

"U.S. tactical aircraft were able to penetrate the relatively heavily defended airspace of North Vietnam at medium altitudes almost at will" (Crawford, 1977:1),\* and the tactics and technologies (primarily electronic counter measures) (ECM) developed during that war were highly effective in countering the Soviet supplied surface-to-air missile (SAM) systems. These same tactics and ECM were equally effective during the 1967 Arab-Israeli War and Israeli aircraft were able to operate with relative safety at the more optimum medium altitudes. Soviet produced SAM systems (primarily the SA-2) were relatively ineffective in limiting operations of tactical air forces. Missile expenditures were high and kills were few.\*\* It was as if the balance had shifted in favor of tactical air power. As a result, greater reliance began to be placed upon tactical air forces and helicopters as a force that "can be concentrated in time and space with the utmost flexibility, and are capable of completely disrupting offensive operations of land forces"\*\*\* (Tobin, 1977:54).

However, judging from the quantity and content of informed opinion appearing recently in Western military writings, this confidence in tactical air power as the equalizer in Central Europe may have been somewhat shaken by the surprising results of the 1973 Arab-Israeli War. The tactics and technologies that had proven so successful a few years earlier were

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\*The system of citation used in this study is the "Author-and-Year Format". References are indicated by name of the author, year of publication and page number. For example (Crawford, 1977:1).

\*\*\*From 24 July 1965, when the first American aircraft was lost through an SA-2 hit, to the end of the first phase of the bombing in February, 1967, 1,500 missiles were launched, bringing down 31 aircraft. Thus, an average of 50 SA-2s were necessary to shoot down each aircraft. This figure increased in 1967 to 59 and jumped in 1968 to more than 100" (Borgart, 1977<sup>b</sup>: 1064).

\*\*\*This view, particularly concerning fire support helicopters is shared by authoritative Soviet military writers as well: "Today helicopters have turned into a powerful means of destroying various ground targets, especially tanks" (Gatsolaev, 1973:65). "When organizing the air defense of motorized, tank and artillery subunits, one takes into consideration the fact that a small group of helicopters can put out of action in a single attack the tank nucleus of, say, an advanced detachment" (Gatsolaev, 1974a:12). Similar views are presented by Belov, 1976; Mikhailov, 1976; and Zakharov, 1977.



extremely costly in aircraft in 1973. The success of Soviet supplied, ground based, air defense systems has led some Western analysts to question the viability and survivability of offensive air operations in a conflict in Central Europe. "Analysis of the 1973 Middle East War and the surface-to-air defenses present there, which are representative of those available in Warsaw Pact countries, leads to the conclusion that it may be extremely costly for present generation fighter aircraft to again penetrate highly defended airspace at medium altitudes" (Crawford, 1977:1).

The results of the 1973 Middle East War clearly exposed the scope of the problem facing tactical air operations. A way had to be found to attack armored targets on the battlefield and survive. The consensus of opinion in the West has been to fly low and fast, but such a tactic is not without its inherent danger. Once in the immediate vicinity of their targets - having underflown SAM coverage of the medium altitudes, attacking aircraft or helicopters still must face the Soviet ground based air defenses of the maneuver forces. Gary Tobin has observed:

The key to this problem, and indeed a major reason why the viability of offensive air support is now being challenged, is the very great strides which the USSR has succeeded in making in the development of effective low cost SAM and AA systems. In the early 1960's this threat was limited to the SA-2 and SA-3, but a satisfactory counter to these weapons was to fly low and fast and in any case the comparative immobility of these early weapons systems prevented their employment in close battlefield support situations. Since that time, however, a whole new family of weapons has emerged; the SA-4, -6, -8, -9, together with the very lethal and highly accurate radar predicted ZSU-23-4 automatic cannon..... (Tobin, 1977:51).

If Crawford's appraisal is correct that the medium altitudes have become too lethal for large scale tactical air operations (and we believe they have), then it is at the lower altitudes where the battle for control of the airspace will be fought on the modern battlefield. Furthermore, it will be that airspace over the leading edge of the maneuver forces that will be decisive and will, therefore, be most hotly contested. However, most recent studies of the tactical air environment have approached the situation purely from a technological perspective (i.e. how to maximize and exploit technological weaknesses in Soviet air defense weapon systems). Too little attention has been focused on the tactical principles upon which Soviet ground based air defenses are employed to protect the maneuver forces.

→ This study ~~attempts to fill that gap and~~ examines Soviet troop air defense tactical employment doctrine and procedures for the protection of the maneuver forces. The air defense protection of the first echelon motorized rifle battalion (MRB) will be analyzed in detail employing a situational approach (i.e. the analysis of the tactical employment of air defense systems as they protect the MRB during various forms of combat

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cont. operations). The choice of the motorized rifle battalion is appropriate as it is consistent with the view expressed by Soviet writers that this unit with normal augmentation is a combined arms tactical podrazdelenie (subunit) that can either independently or in conjunction with other units accomplish decisive missions (Garbuz et al, 1972:3).

Soviet sources (primarily Voennyi Vestnik) have been <sup>were</sup> used almost exclusively. Consequently, the analysis is based upon what the Soviet military is writing about the tactical employment of its own weapon systems and, therefore, the coverage is not and cannot be totally complete. For example, prior to the early 1970's little was written about the tactical employment of the ZSU-23-4 and almost nothing was in print concerning the employment of the SA-7 prior to 1975. The wall of silence still exists concerning the SA-9 and the SA-8. For these reasons, Western sources have been used sparingly to amplify, where possible, information lacking in the Soviet material.

#### AIR DEFENSE ORDER OF BATTLE

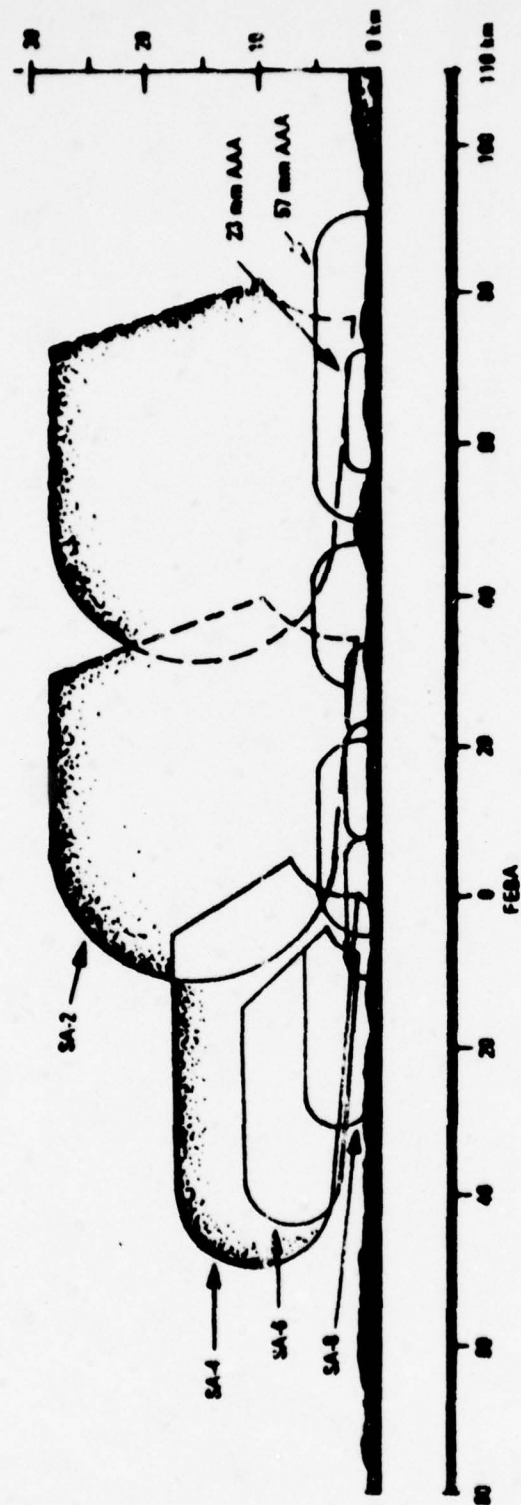
The Soviet Union currently possesses the most extensive ground based troop air defense\* system in the world. The Soviet Army has at its disposal some 9,000 antiaircraft artillery (AAA) pieces, primarily 57mm and 23mm towed and self-propelled automatic cannon. This impressive arsenal of antiaircraft artillery is integrated into an equally impressive distribution of surface-to-air missile systems to produce an all-altitude, organic air defense for the ground forces capable of providing continuous cover of the fast moving formations. In the last decade, the Soviet Union has fielded four new mobile surface-to-air missile systems which have been optimized to cover specific portions of the air space over the ground forces and are able to keep up with them. Gaps in the low-altitude missile coverage are protected by the radar-directed ZSU-23-4 self-propelled antiaircraft gun which has become the main AA artillery piece of the Soviet division.

The air defense protection of the Soviet motorized rifle battalion should not be examined in isolation as it is a component of a much more extensive defensive arrangement. Soviet air defense doctrine calls for the battalion to operate under an air defense umbrella established by the air defense assets of the division and the army. Figure 1 is a schematic presentation of the air defense coverage of a Type Soviet Army in the vertical plane. The coverage extends well beyond the forward edge of the battle area (FEBA) and to nearly 30,000 meters above it. Figure 2 is a presentation of the SAM defense of a Type Soviet Army in the horizontal

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\*Troop air defense consists of those air defense forces designated to protect the ground forces and subordinate to the Ground Force Commander. It does not include air defense forces which protect the homeland (Voiska Protivovozdushnoi Oborony Strany-PVO Strany) or fighter/interceptor aircraft assigned to the Air Forces (Voenno-Vozdushnye Sily-VVS).

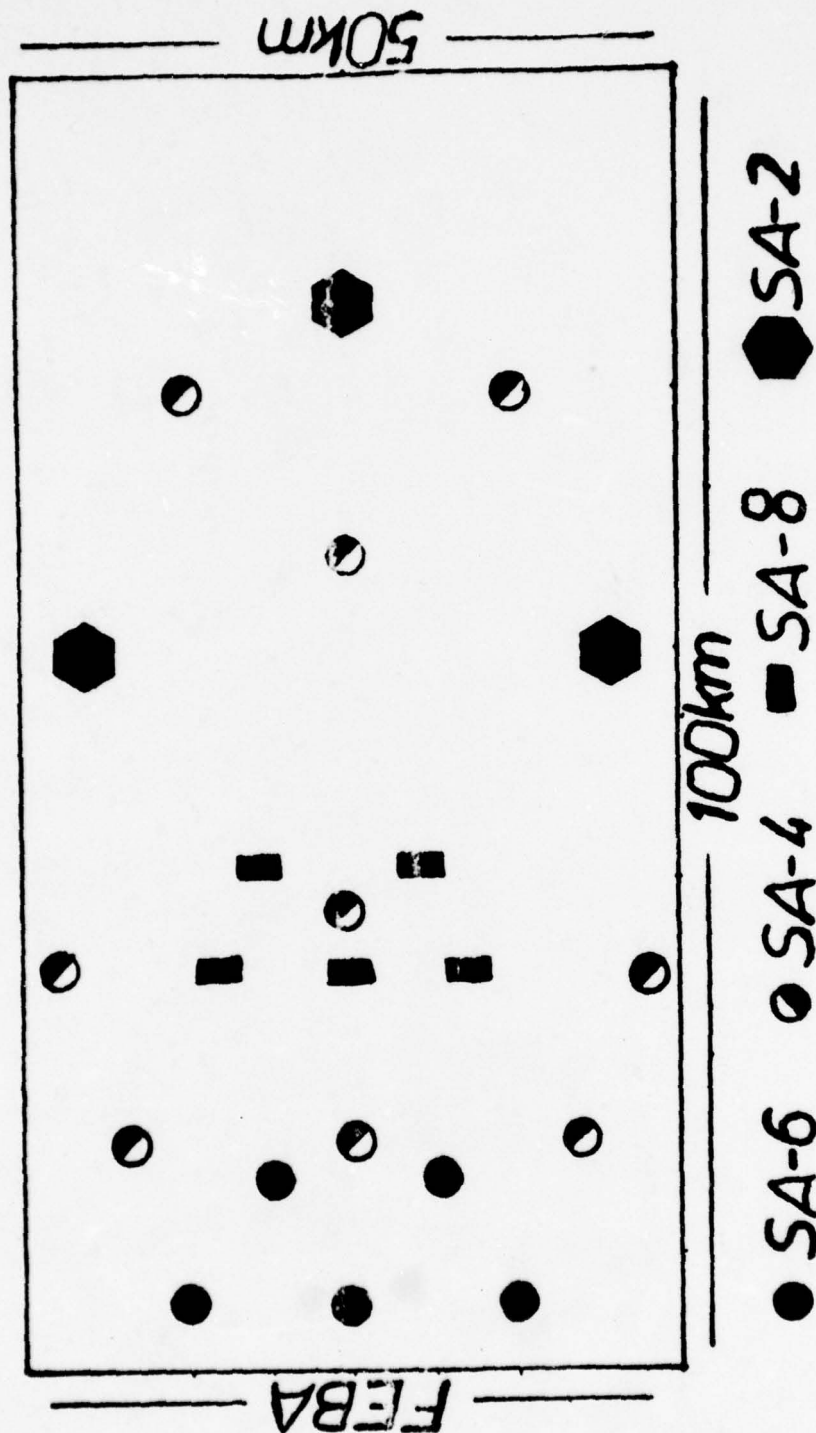
Figure 1. TYPE ARMY AIR DEFENSE ENVELOPE<sup>1</sup>



SOURCE: USAITAD Report No. 14-U-76

1. DOES NOT INCLUDE AIR DEFENSE WEAPONS OF MANEUVER REGIMENTS AND LOWER ECHELONS

Figure 2. SAM Air Defenses of a Type Soviet Army (3-4 Divisions)  
Advancing on a Front of 50 km, with a Depth of 100 km.



SOURCE: Meller, 1977:13

plane. SAM units are far forward and are able to extend their coverage well beyond the FEBA and flanks while providing good coverage of the entire army area.

While a detailed technical description of all Soviet air defense weapon systems is beyond the scope of this study, a short description of the most significant systems follows:

ZSU-23-4 (Zenitnaia Samokhodnaia Ustanovka): This proven 23mm self-propelled automatic gun has become the primary AAA cannon of the Soviet ground forces. It is found at all levels and is thought to be replacing the 57mm ZSU-57-2 self-propelled automatic cannon and the S-60 radar directed AAA cannon. The ZSU-23-4 is a quad-mounted antiaircraft gun on a modified PT-76 light tank chassis.\* It uses a radar antenna and gun stabilization system which enables it to deliver aimed fire while on the move. Firing can be conducted in one of three modes. In the automatic mode, the radar automatically tracks the target and determines target range and angular position. The on-board computer determines lead angles and the fire control system automatically positions the cannon. In the second mode, the target is tracked optically with the aid of a gunsight while the radar is used to determine range only. As in the previous mode the computer and fire control system position the cannon. In the third mode, the entire function is performed manually using a backup gunsight and hand cranks to position the cannon. The automatic mode is preferred for firing against aerial targets (Strelkov, 1975:16).

The maximum effective range of the weapon against aerial targets is 2,500 meters and the rate of fire is 3,400 rounds per minute fired in bursts of 3-5 or 5-10 rounds per barrel. When firing against high-speed targets, bursts of up to 50 rounds per barrel are used. Both fragmentation, high-explosive, incendiary, tracer rounds and armor piercing, incendiary, tracer rounds are fired. The normal sequence is three fragmentation, high-explosive, incendiary, tracer rounds followed by one armor-piercing, incendiary, tracer round. The standard ammunition load carried on the vehicle is 2,000 rounds. The weapon has a four man crew - commander, scan radar operator/gunner, range operator and driver.

The ZSU-23-4 is a highly accurate, lethal air defense weapon system that was extremely effective in the 1973 Middle East War (Tobin, 1977:51).

SA-6 (Gainful): The SA-6 surface-to-air missile system is a highly mobile tactical air defense weapon. A battery is thought to consist of three tracked (modified PT-76) transport and launch vehicles each with three missiles and one tracked (also modified PT-76) fire control vehicle with an acquisition radar and a target tracking and illuminating radar. The SA-6 can search and acquire targets independently using its organic acquisition radar or, as is more likely, be used in conjunction with a specialized search radar. The extremely high speed (mach 2.5) of the missile makes it difficult to evade and the multiple frequencies employed make it equally difficult to jam electronically. The radar system operates in both pulse

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\*The ZSU-23-4 is not amphibious.



and continuous wave modes and the missile completes the terminal phase of the intercept using semi-active radar homing guidance. The range of the SA-6 is probably 30 km against low-altitude targets with a minimum engagement range of 4 km from the launcher (Pretty, 1977:79). A SA-6 brigade is assigned to each Soviet army. Little is published in Soviet sources concerning the characteristics or employment of the SA-6 missile system.

SA-8 (Gecko): The SA-8 is a relatively new highly mobile forward air defense system. It is an autonomous, self-contained system with all components mounted on a single wheeled vehicle. The vehicle carries the search and tracking radars as well as two missile tracking radars, and four missiles on launchers. It is thought that the vehicle also carries one complete reload of missiles and is amphibious. The two separate missile tracking radars indicate a capability for the simultaneous firing of two missiles with separate guidance for each and it appears almost certain that the SA-8 can engage two targets separately. Under conditions of jamming, the missiles may be fired while the target is tracked optically. Range of the SA-8 is thought to be 10 km. The SA-8 is assigned to each motorized rifle and tank division (Wiener and Lewis, 1977:373). Almost nothing is published in Soviet sources concerning the characteristics and employment of this weapon system.

SA-9 (Gaskin): The SA-9 appears to be a vehicle mounted derivative of the SA-7 portable SAM system. Four missile launchers are mounted on an amphibious BRDM-2 wheeled vehicle with the launcher crewman's position at the base of the launcher. Targets are acquired optically although it has been reported that the SA-9 can be linked to surveillance radars or target data may be passed by radio to assist in target acquisition. Range of the SA-9 is thought to be 7 km. A battery of four SA-9's are assigned to each motorized rifle and tank regiment. Almost nothing is published in Soviet sources concerning the characteristics or employment of the SA-9.

SA-7 (Grail): The SA-7, designated in Soviet terminology as PZRK (Perenosnyi Zenitnyi Raketnyi Kompleks), will be found dispersed in large numbers throughout the battlefield. The SA-7 is the organic air defense means of the motorized rifle battalion. It is a small (1.5m), lightweight (15 kg), man-portable missile that can be set up and fired almost immediately. Additional reloads are carried in the BMP. Targets are acquired optically and the missile completes interception using infra-red homing. A newer version, named Strela-2, may have an IFF (Identification Friend or Foe) capability (Wiener and Lewis, 1977:374). Also it appears likely that the SA-7 gunner receives an audible signal indication that the missile seeker head has locked on the target and not on jamming. If the seeker head has locked on jamming (IR flares), the gunner can apparently break-off the engagement, wait until the target is clear of the jamming, reenergize the system and engage (Nikulin, 1976:29). The range of the SA-7 is thought to be 5 km, although Wiener and Lewis report that the improved version may have greater range (1977:374). The missile employs a fragmentation warhead which some observers consider to be a serious limitation (Borgart, 1977<sup>b</sup>:1064).

Other air defense weapon systems that are used extensively are the SA-2 SAM (a regiment of three batteries is assigned to the army), the



S-4 SAM (a brigade is assigned to the army), the ZSU-57-2 57mm twin automatic cannon (these may still be found in some AAA regiments of the division and also at army level), and the S-60 57 mm radar directed cannon (these also may be found in some divisional antiaircraft regiments and at army).

Additionally, Soviet writers stress the use of infantry weapons and the antiaircraft machineguns mounted on tanks to repel enemy air attacks. When small arms are employed, their use is tightly controlled by the commander and they will be employed in mass. A platoon will concentrate its fire against a helicopter and an entire company against a high-performance aircraft.

### SOVIET PHILOSOPHY OF AIR DEFENSE

Before examining the tactical employment of Soviet troop air defense, a short discussion of the philosophy concerning the roles and missions of air defense currently operable in Soviet thinking would be beneficial. These perceptions directly influence the manner in which troop air defense is approached and the tactical employment of air defense units.

A review of Soviet perceptions concerning the role and mission of troop air defense as expressed in Voennyi Vestnik and other publications indicates that the operative principles are "purposefulness," "coordination," "maneuverability," "continuity" and "surprise."

Lieutenant General V. A. Gatsolaev summarizes the principle of "purposefulness" when he wrote:

The essence of an antiaircraft podrazdelenie's combat mission can be expressed with two words "to cover." The term "to cover" could equally be replaced with the phrase "to defend against danger from the air" or even more precisely, "to prevent strikes and reconnaissance of the target from the air." In other words, the antiaircraft podrazdelenie engages in battle against an air enemy not generally but in the interests of certain forces or rear services facilities (Gatsolaev, 1974:95-96).

This means in effect that the activities of air defense forces are not independent. Air defense units function above all in the interests of some other tactical formation and their activities are directly related to the mission of the supported force. Thus, the relatively high degree of centralization and the nearly complete control the ground force commander exercises over all facets of air defense observable in the operations of Soviet troop air defense become understandable in light of this principle. Moreover, it is quite clear from Soviet writings that shooting down aircraft is, in the final analysis, secondary to preventing damage to the supported unit that would interfere with the accomplishment of its mission. This might even include not firing upon a clearly hostile aircraft when such fires may compromise the supported unit's position.

"Coordination" means that the combat activities of all air defense means are coordinated at the lowest level exercising control over them. To accomplish this, the combined arms commander at all levels organizes the air defense of his unit and the assigned or attached air defense commander acts as his advisor. In practice, the senior commander quite often designates demarcation lines in both the vertical and horizontal plane which then become zones within which certain types of air defense weapon systems have priority of engagement. In this manner the combined arms commander can coordinate the activities of interceptor aircraft, SAM's and AA guns and this coordination as well as the demarcation lines become a component of his order to subordinate commanders.

"Maneuverability" of air defense weapons is an outgrowth of the high rates of advance Soviet planners anticipate in future conflicts. The Soviet perception of maneuverability considers both the physical displacement of the weapons and the shifting of their fires from one target to another. Only the most mobile air defense weapon systems - preferably those which can fire on the move - are designated to protect the fast moving forces. Air defense units are deployed so as to be able to engage a single target with all weapons or each weapon can engage a separate target. In accordance with this principle, the air defense weapon systems protecting the MRB, as we will see later, are all as mobile as the battalion.

"Continuity" of air defense coverage is related to the mobility of the air defense weapons but also means air defense formations must be constantly shifting positions and coverage and that logistic support must be continuous and timely. Continuity of the coverage is especially important during river crossings (which will be discussed later) and during the introduction of second echelon units into the battle. Continuity of the coverage also explains the insistence in Soviet writings that under no circumstances must the air defense weapons become separated from the maneuver unit they support. In some cases this has been carried to the extreme that antiaircraft units are prohibited from stopping to fire on attacking aircraft even though their fires would have been much more effective from the short halt.

The principle of "surprise" has received considerable emphasis recently in Soviet publications and training exercises. This principle is based on the realization - possibly as a result of the Arab experience - that, because of their effectiveness, the air defense unit itself has become a primary target for air attack. The Soviet perception is that the enemy will devote considerable effort and resources to locate air defense positions in order to either attack them directly or to avoid them. By surprise the Soviets hope to bring sudden, overwhelming and unexpected fire on unsuspecting enemy aircraft and helicopters.

Soviet writers stress that to achieve surprise air defense positions must be well concealed, strict firing discipline observed, and alternate firing positions prepared in advance. Specific tactics designed to ensure surprise will be discussed in detail in the chapter on the air defense of the battalion in the defense.

## ORGANIZATION OF THE MOTORIZED RIFLE BATTALION FOR AIR DEFENSE

The only organic, dedicated air defense means available to the MRB is the SA-7 man-portable SAM system. A section of three SA-7 gunners is assigned to each motorized rifle company. Thus, there are a total of nine SA-7 gunners in the motorized rifle battalion. There was no indication in the literature as to the number of missile reloads within the company, although each BMP has a storage rack capable of transporting one SA-7 missile (CO D, undated: 3-20). Therefore, if each BMP were to carry its full complement of SA-7s, the battalion would have a basic load of at least 30 SA-7s.

Organic air defense is provided the motorized rifle regiment by an assigned battery of four ZSU-23-4 fire units\* divided into two platoons and a battery of four SA-9 fire units.

The ZSU-23-4 battery routinely supports first echelon battalions. Depending upon the mission of the battalions, the battery may be attached as a single entity or it may be split into two platoons with a platoon attached to each first echelon battalion. For example, a MRB that is performing the mission of an advance detachment for the regiment would normally have a battery of ZSU-23-4s attached (Mikhailov, 1976:28). On the other hand, if the regiment is advancing with two battalions in the first echelon, each of these battalions will be augmented with an attached ZSU-23-4 platoon (Todorov, 1976:83).

From the literature it was impossible to determine what procedures apply to the SA-9 unit at regiment. None of the articles reviewed even mentioned this weapon system and there was nothing to indicate that SA-9 fire units were attached to motorized rifle battalions. We can only conclude, based upon the widespread availability of a missile system (SA-7) complementary to the ZSU-23-4 guns at the battalion level, that the SA-9 is probably not detached and that it performs missions assigned by the regimental commander.

Furthermore, there is no indication as to how the regimental air defense assets are organized. Some authors refer to a ZSU-23-4 unit with four fire units as a platoon, while others term that same sized unit a battery with a battery commander and a battery command post. Since late 1976, Soviet authors more frequently use battery when addressing a four fire unit organization and this is the organizational structure we shall follow. Also, there is frequent reference in the literature to a regimental air defense officer. This would seem to indicate that the SA-9s are organized into a battery and that some type of control headquarters has been organized above these two batteries. This seems even more plausible in light of the references to the regimental air defense officer having

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\*A fire unit is the smallest air defense organization that can independently accomplish all the air defense functions - acquisition, identification and engagement. Individual ZSU-23-4 mounts, SA-9 mounts and SA-7 gunners are fire units.



independent means of radar surveillance (unspecified) and a communications channel to the ZSU-23-4 battery when attached to a MRB.

## CHAPTER II

### AIR DEFENSE OF THE MOTORIZED RIFLE BATTALION IN THE OFFENSE

#### THE ATTACK FROM THE MARCH

The widespread availability of tactical nuclear weapons has led Soviet military writers to conclude that a prolonged concentration of troops and materiel in the immediate vicinity of a planned offensive would be extremely dangerous. Concentrations of troops would immediately become priority targets and nuclear weapons have given military forces the capability of destroying such concentrations without committing large quantities of artillery or aircraft. Moreover, the nearly complete mechanization of the maneuver forces no longer requires the assembly of large numbers of troops at short distances from the enemy in order to launch an offensive (Sidorenko, 1970:64).

Accordingly, Soviet doctrine envisions the attack being launched, in most circumstances, by troops and equipment which have been brought in that purpose from relatively secure positions behind the line of immediate contact. Sidorenko asserts that "to launch an attack on a prepared defense from the march by moving out from a waiting area" is a "fundamentally new method" (Sidorenko, 1970:66) and is basic. The march, which is defined as "an organized movement of troops in march column by road, unimproved road, and quite often over open, roadless terrain" (Garbuz et al, 1972:7) will be encountered quite frequently. March situations will be employed in the offense as a preliminary to a meeting engagement, in the pursuit, while bringing up the division's second echelon for introduction into the battle, or for shifting forces in another direction. While on the defensive, forces being moved forward to conduct a counterattack will also employ the march (Garbuz et al, 1972:9).

Forces conducting a march are normally enroute to accomplish a combat mission critical to the ground force commander. As a result, the enemy is expected to be far from indifferent to the route and progress of these columns and will subject them invariably to air attack in order to destroy or delay them. Consequently, Soviet writers stress the absolute necessity of effective air defense coverage of march columns to include both active and passive measures and continuous reconnaissance (Garbuz et al, 1972:38).

The MRB may perform the march semi-independently - while operating in the advance detachment of the regiment, or moving to the attack from the interior - or be located in the body of the regiment's main force. For the purpose of this study, the air defense of the battalion is approached as if it were functioning semi-independently. In this manner, we can examine the battalion with its normal complement of attachments - particularly air defense. While functioning in the body of the regiment's main force, the air defense of the MRB closely resembles the air defense of the main

body of the battalion acting independently with the exception that additional air defense means are not attached. It appears very likely that march column protection of the main body is provided by the SA-9 battery which we stated earlier is held at regimental level.

A MRB operating as the advance detachment of a regiment is generally reinforced with a tank company, artillery support, engineer support and an antiaircraft battery (four ZSU-23-4 fire units). Thus in addition to the assigned nine SA-7 gunners (three per company) and the machineguns and automatic weapons of the rifle companies, the battalion commander has at his disposal for air defense the antiaircraft machineguns of the attached tanks and the attached ZSU-23-4s.

In situations requiring a march, the battalion's operations generally consist of three phases or distinguishable tactical formations: in the waiting area, during the march itself, and when deployed for the meeting engagement or attack. Assigned and attached air defense weapons, in turn, adopt different tactical formations to support each of these phases.

#### AIR DEFENSE IN THE WAITING AREA

The area selected to assemble the battalion prior to the initiation of the march should be large enough to disperse the companies in order to minimize the effects of weapons of mass destruction as well as provide concealment from aerial surveillance. The battalion commander will be provided information as to the coverage provided by the air defense assets of the senior commander as well as intelligence concerning enemy tactical aircraft and helicopter activity. Based upon this information and an evaluation of the terrain, the battalion commander, advised by the anti-aircraft battery commander, assigns sectors of responsibility to the SA-7 gunners, the AAA battery and, if necessary, the companies for engagement of aircraft and helicopters with machineguns and automatic weapons. The most important factors influencing the assignment of sectors of responsibility are the effectiveness of concealment, the availability of low-altitude approaches into the waiting area and the availability of aerial surveillance data from the regimental/divisional surveillance radar or surveillance radars of adjacent units. While several variations in tactical formations are thus possible, certain general characteristics may be inferred from the literature. If low-altitude approaches into the waiting area are available, the air defense tactical formation is weighted in that direction, particularly the ZSU-23-4s. All-around coverage is still provided but the preponderance of air defense combat power is oriented on the most dangerous approach. If possible, the tactical formation is oriented so that all air defense weapons are able to engage targets approaching from the direction of the greatest threat. The most efficient tactical formation to accomplish this is a rhombus (Gatsolaev, 1974:112). SA-7 gunners operate within their companies. They may be deployed in a line facing the most dangerous low-altitude avenue of approach within their assigned sector or in a triangle with its apex facing the most dangerous direction. Soviet writers recommend this latter arrangement in order to facilitate control of fires (Nikulin, 1976:29). Each SA-7 gunner is assigned a



sector of responsibility which overlap by approximately 15-20 degrees. Sectors of responsibility of individual ZSU-23-4 fire units also overlap.

If particularly dangerous low-altitude approaches are absent or the terrain provides sufficient concealment, the preferred method is to have the ZSU-23-4 battery function as a unit with individual guns separated by a distance of 200-250 meters, although situations have been observed where the battery was deployed by platoons separated by an interval of up to 1000-1500 meters. The determining factors appear to be terrain, size of the area, and availability of suitable firing positions. The AAA battery is generally oriented in the direction of the enemy and is located in the vicinity of the battalion command and observation post in order to protect it. The SA-7 gunners are deployed within their company areas with the apex of their triangles oriented towards center of the sector (Mikhailov, 1973:77).

Figures 3 and 4 depict possible variants of the tactical formations of a MRB in the waiting area. Figure 3 represents probable low-altitude avenues of approach and Figure 4 is without such approaches. They clearly demonstrate the relationship between threat and concealment on the one hand and air defense tactical formations on the other.

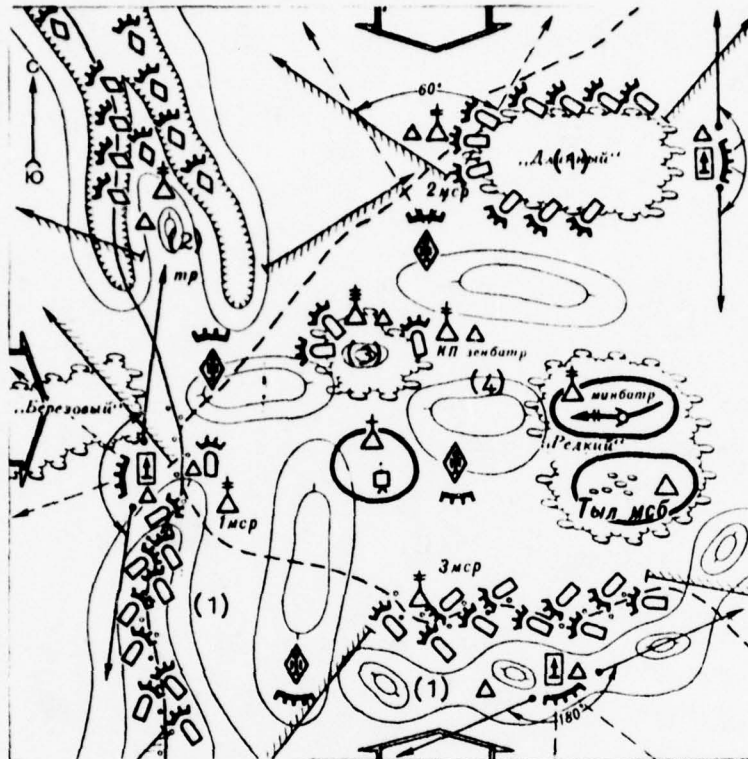
Soviet writers consider aerial surveillance to be crucial for the survival of tactical formations on the modern battlefield. The capability of modern aircraft/helicopters to operate at low-altitudes and of helicopters to hover in ambush behind the masking of terrain features effectively negates long-range radar surveillance (Gatsolaev, 1973:65). Consequently, considerable emphasis is placed upon visual observation using organic personnel as aerial observers. Air observers are appointed in each platoon and company and also at the battalion command and observation post. They receive special training in aircraft recognition and identification procedures\* and are provided the means to issue the air warning. The aerial surveillance system of a MRB in the waiting area is based upon the surveillance radars of the ZSU-23-4. The antiaircraft battery commander checks radar masking and sites his guns to obtain maximum coverage. Areas masked to the radars are covered by aerial observers. Each observer is assigned a primary zone for observation of aerial targets.

Air defense related communications are established within the MRB to ensure the timely warning of the threat of air attack and to control the distribution of antiaircraft fires. Communications are both signal (colored rockets, flags etc.) and radio. Wherever possible redundancy is built into the system and duplicate means are routinely employed. Information concerning the air threat is received at the battalion by radio on the regimental commander's net and also on the air defense net established between the antiaircraft battery commander and the regimental air defense officer (Bulatov and Poliakov, 1976:84-85). Air threat data received from

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\*One author states that friendly (Soviet) aircraft will execute pre-determined maneuvers, launch colored rockets, or turn on navigation or landing lights to confirm their identity for ground observers (Grishin, 1974:94).

Figure 3. Air Defense of a Motorized Rifle Battalion in the Waiting Area (Variant)



(Not Drawn to Scale)

SOURCE: Bulatov and Polykov, 1976:85

#### LEGEND

1. Motorized Rifle Company Assembly Area
2. Tank Company Assembly Area
3. Battalion Command and Observation Post
4. Antiaircraft Battery Command Post

#### SYMBOLS








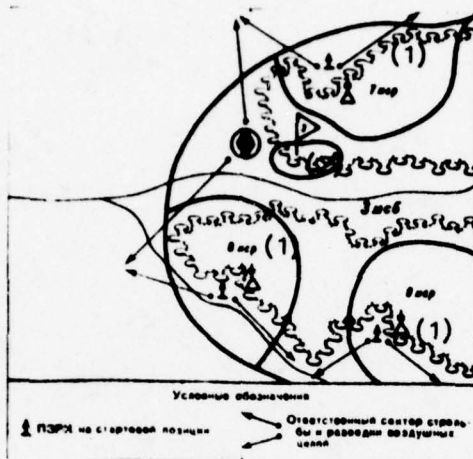
-  ZSU-23- Fire Unit
-  SA-7, Section in Firing Positions
-  Aerial Observer
-  Sector of Responsibility for Aerial Observation
-  Primary Target Line (PTL); Primary Sector
-  Sector of Fire for Company Weapons
-  Probable Avenue of Approach

Figure 4. Air Defense of a Motorized Rifle Battalion  
in the Waiting Area (Variant)



(Not Drawn to Scale)

SOURCE: Mikhailov, 1973:77

#### LEGEND

1. Motorized Rifle Company Assembly Area
2. Battalion Headquarters and Command and Observation Post

#### SYMBOLS



ZSU-23-4 Battery in Firing Position

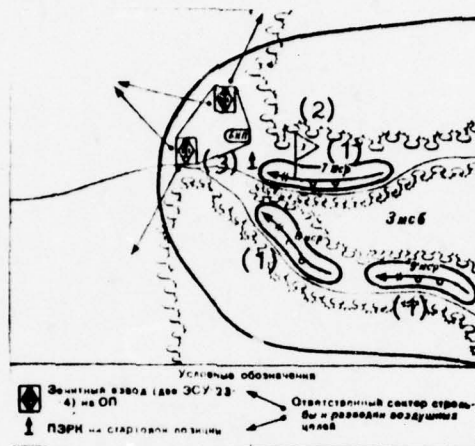


SA-7 Section in Firing Position



Sector of Responsibility for Observation and Firing

Figure 4a. Air Defense of a Motorized Rifle Battalion  
in the Waiting Area (Variant)



(Not Drawn to Scale)

SOURCE: Mikhailov, 1973:78

#### LEGEND

1. Motorized Rifle Company in Column
2. Battalion Command and Observation Post
3. Antiaircraft Battery Command Post

#### SYMBOLS



ZSU-23-4 Platoon in Firing Positions



SA-7 Section in Firing Positions



Sector of Responsibility for Observation and Firing



higher headquarters is relayed to the ZSU-23-4 guns by means of the anti-aircraft battery net and to the assigned or attached companies by means of the battalion commander's radio net. The companies in turn relay air threat information to the SA-7 gunners. Warning of aircraft detected by aerial observers is accomplished by established signals (generally, according to the literature, one or two colored rockets in the direction of the aircraft). A duplication of this signal is a short code-word transmission by the company commander on the battalion commander's radio net. The code word most frequently used for this purpose in the various articles was "vozdukh" (air) sometimes followed by three digits (e.g. 555). Air warning of aircraft detected by the ZSU-23-4 gunners is accomplished by the antiaircraft battery commander over this same net (Mikhailov, 1973:78).

Signals are also established to facilitate fire distribution and to shift the fires from one or all guns onto a particular target. Soviet writers caution that rapid shifting of fires is essential particularly when helicopters use the diversion created by an aircraft attack to push their attack at low-altitude from another direction. Generally the signal for a shift of fire is a rocket of a prearranged color in the direction of the new target or a short, coded radio signal (Gatsolaev, 1973:70).

Control of air defense fires is highly centralized, particularly when the battalion is in a static position (e.g. a waiting area), although there appears to be an ongoing debate in Voennyi Vestnik concerning the degree of centralization of control that should be exercised over SA-7 gunners. Kabulakhin (1977:105) argues that the company commander often forgets about the SA-7 gunners and concentrates his entire attention on the ground situation. Therefore, it is best for the regimental air defense officer to retain control over the SA-7 gunners. While others (Bulatov and Poliakov, 1976:86) find that control of the SA-7 gunners by even the battalion commander is too highly centralized. The consensus appears to be that company commanders and, in some cases, the platoon commanders should direct the fire of SA-7 gunners.

The fires of the ZSU-23-4 fire units are controlled by the battery commander through previously issued instructions concerning the sequence and priorities of protection and engagement as well as verbal commands for the shifting of fires. Mount commanders have the authority to engage suddenly appearing targets.

While in the waiting area, in order to preclude fatigue and to permit routine maintenance of equipment, one SA-7 gunner per company and one ZSU-23-4 per platoon is designated as the duty weapon and is prepared to open immediate fire. With the appearance of aircraft or the receipt of early warning the remaining ZSU-23-4s and SA-7 gunners prepare to fire. Additionally, if enemy aircraft have been particularly active a platoon within each company may be designated to be in a duty status for the engagement of aerial targets (Garbuz et al, 1972:51).



## AIR DEFENSE ON THE MARCH ROUTE

The MRB may adopt various tactical formations (groupings of forces) while conducting the march, depending upon the tactical mission to be accomplished at the completion of the march. Reznichenko (1966) identifies four conditions for conducting the march that alter the march formation of the battalion: the march in anticipation of a meeting engagement, the offensive march with advance from the depth (approach march), the pursuit march (parallel axis), and the withdrawal march. For convenience in examining the air defense of the MRB, offensive march situations may be grouped into two major categories: the march with expectation of meeting the enemy at some undetermined location (march preliminary to meeting engagement and the pursuit march) and the march with the expectation of meeting the enemy at a predetermined location (approach march). Other march situations fall readily into either of these categories depending upon the commander's assessment of the likelihood of meeting the enemy and where.

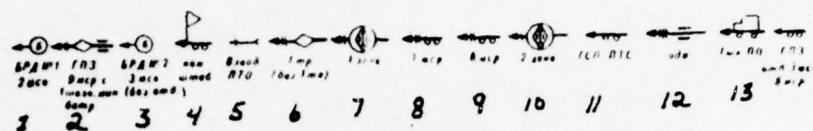
While conducting a march with the expectation of meeting the enemy at an undetermined location, the MRB normally employs a tactical formation as shown in Figure 5. The ZSU-23-4 battery proceeds within the main body and, as a rule, in the column of the company with which the battalion command and observation post is advancing (Mikhailov, 1973<sup>a</sup>:24). The preferred tactical formation of the ZSU-23-4 battery within the column is by platoons in column of mounts. This arrangement ensures a compact battery formation, permits the massed fires of all guns on one target and facilitates fire distribution (which is accomplished by the battery commander who follows immediately behind his battery) should multiple targets appear (Todurov, 1976:82). However, if enemy air activity has been particularly intense and terrain permits air attacks along the length of the column, one platoon may be positioned at the head of the column and the other at the tail (Gatsolaev, 1974:100). In this case, the antiaircraft commander follows with the battalion command and observation post (Mikhailov, 1973<sup>a</sup>:24).

Regardless of the manner ZSU-23-4 fire units are integrated into the column, Soviet authors stress that the composition of the column should not hinder their ability to detect and engage low-altitude targets. Therefore, large pieces of equipment or vehicles will not be positioned directly to the front or rear of a ZSU-23-4 fire unit. Moreover, the distance between ZSU-23-4 mounts and the nearest vehicle or tank will be no less than 50 meters (Gatsolaev, 1974:100).

The SA-7 gunners will proceed within the column of their companies. They are, as a rule, located in the same vehicle as the company commander (Bulatov and Poliakov, 1976:86).

As in the waiting area, continuous, all-around surveillance is organized within the march column. However, due to the reduced effectiveness of the ZSU-23-4 radar system to detect targets while on the move and the difficulties in detecting aerial targets while moving, aerial observers are designated on each vehicle in the column. Designated sectors for aerial observation are in relation to the movement of the column (either right or

Figure 5. Air Defense of a Motorized Rifle Battalion  
in March Column



#### LEGEND

1. Combat Recon Patrol No. 1: 2<sup>d</sup> MR Plt
2. Advance Detachment: 9<sup>th</sup> MR Co w Tank Plt and Mortar Btry
3. Combat Recon Patrol No. 2: 3<sup>rd</sup> MR Plt (-sqd)
4. Bn Hq
5. Antitank Plt
6. 1st Tank Co (-Plt)
7. 1st Antiaircraft Plt (ZSU-23-4)
8. 7<sup>th</sup> MR Co
9. 8<sup>th</sup> MR Co
10. 2<sup>d</sup> Antiaircraft Plt (ZSU-23-4)
11. Engineer Squad
12. Artillery Bn
13. Bn Rear

left) and the greatest overlap of sectors are along the flanks of the column. Surveillance to the front and rear of the column is accomplished by the ZSU-23-4 fire units each covering a sector of 80 degrees. Center of sector is the azimuth of the direction of march for the lead ZSU-23-4 and the appropriate back azimuth for the one in the rear (12 and 6 o'clock respectively in relation to the direction of movement) (Chuvakin and Logvinenko, 1973:78). Companies are assigned aerial observation sectors to the right and left of the column. The sector of each individual observer as well as those of companies overlap by 20-30 degrees and sectors assigned to individuals are held to 30 degrees. Sectors of aerial observation generally correspond to sectors of responsibility for firing (Grishin, 1974:96).

Communications (both signal and radio) are established for alerting the battalion of the approach of hostile aircraft. For aircraft detected by the battalion's aerial observers, the alert is given by means of a pre-arranged signal (usually a colored rocket in the direction of the detected aircraft). A duplicate signal will be transmitted by radio over the battalion commander's net (Gatsolaev, 1974:104). Intelligence concerning enemy air activity and the approach of aircraft of interest to the column is received first at the AAA unit command post from the regimental air defense officer and is then relayed via the battalion commander's net to the rest of the battalion.

While surveillance is continuously maintained in a high state of readiness, the actual air defense preparedness of the battalion may be slightly relaxed to avoid overly fatiguing the crews. If enemy air activity has been light or the march column is still some distance from the enemy positions, only a portion of the battalion's air defense assets are prepared to conduct immediate fire (Readiness Condition No. 1). Every second ZSU-23-4 fire unit is at Readiness Condition No. 1 (systems energized, guns loaded and crews manning their positions and searching for targets, while the remaining mounts are at a lesser state of readiness (Gatsolaev, 1974:105). This same procedure applies to the SA-7 gunners. Only one SA-7 gunner in each company is at Readiness Condition No. 1 (Mikhailov, 1976:28). Also, infantry and tank companies maintain on-duty elements (the equivalent of Readiness Condition No. 1) to engage low-flying aircraft or helicopters while on the move and during halts (Garbuz et al, 1972:51).

The air defense readiness of the battalion will be increased whenever the battalion enters a zone of increased air activity; approaches the enemy; passes through defiles, road junctions or river crossings; stops for halts or breaks; and, of course, whenever hostile aircraft are detected. During rest halts, the column maintains its march formation and pulls to the right of the road with vehicles no closer than 10 meters apart. Aerial observers, radio operators, and personnel assigned to fire on low-flying aircraft (e.g. with tank antiaircraft machineguns) will remain with their vehicles, while the remaining personnel deploy to the right of the road. The unit designated to engage low-altitude targets with infantry machineguns and automatic weapons will be deployed in one location (Garbuz et al, 1972:51-54). The ZSU-34-4 battery will deploy in



combat formation with all mounts at Readiness Condition No. 1 with separation distances of 30-40 meters between mounts. Upon resumption of the march, the ZSU-23-4 fire units will again take their assigned positions in the column.

Upon receipt of an air warning, the actions of the battalion appear to depend upon terrain. If the warning is received while the column is passing through a wooded area, the column will be halted along a portion of the road offering concealment from the air and the vehicles will be camouflaged. All antiaircraft means are brought to Readiness Condition No. 1. To preclude giving away the position of the battalion, single aircraft will not be engaged, unless it attacks the battalion directly and then, depending upon the threat posed by the attack, only on-duty weapons may engage the aircraft (Kiriukhin, 1975:86). If the threat is serious, all antiaircraft and infantry weapons will engage the targets.

If the column is passing through terrain lacking concealment opportunities, the march will continue with a corresponding increase in the intervals between vehicles. The ZSU-23-4 mounts will engage targets on the move or at the short halt. Although the ZSU-23-4 may conduct aimed fire on aerial targets while moving, its accuracy is considerably enhanced if it fires from the halt. However, one author emphasized the overriding importance of the ZSU-23-4s keeping up with the columns they are covering and that under no circumstances should they fall behind even to engage aircraft or helicopters (Molchanov, 1975:86). The literature did not indicate to what degree SA-7 gunners could engage targets on the move or that short halts would be made to enable SA-7 gunners to fire missiles.

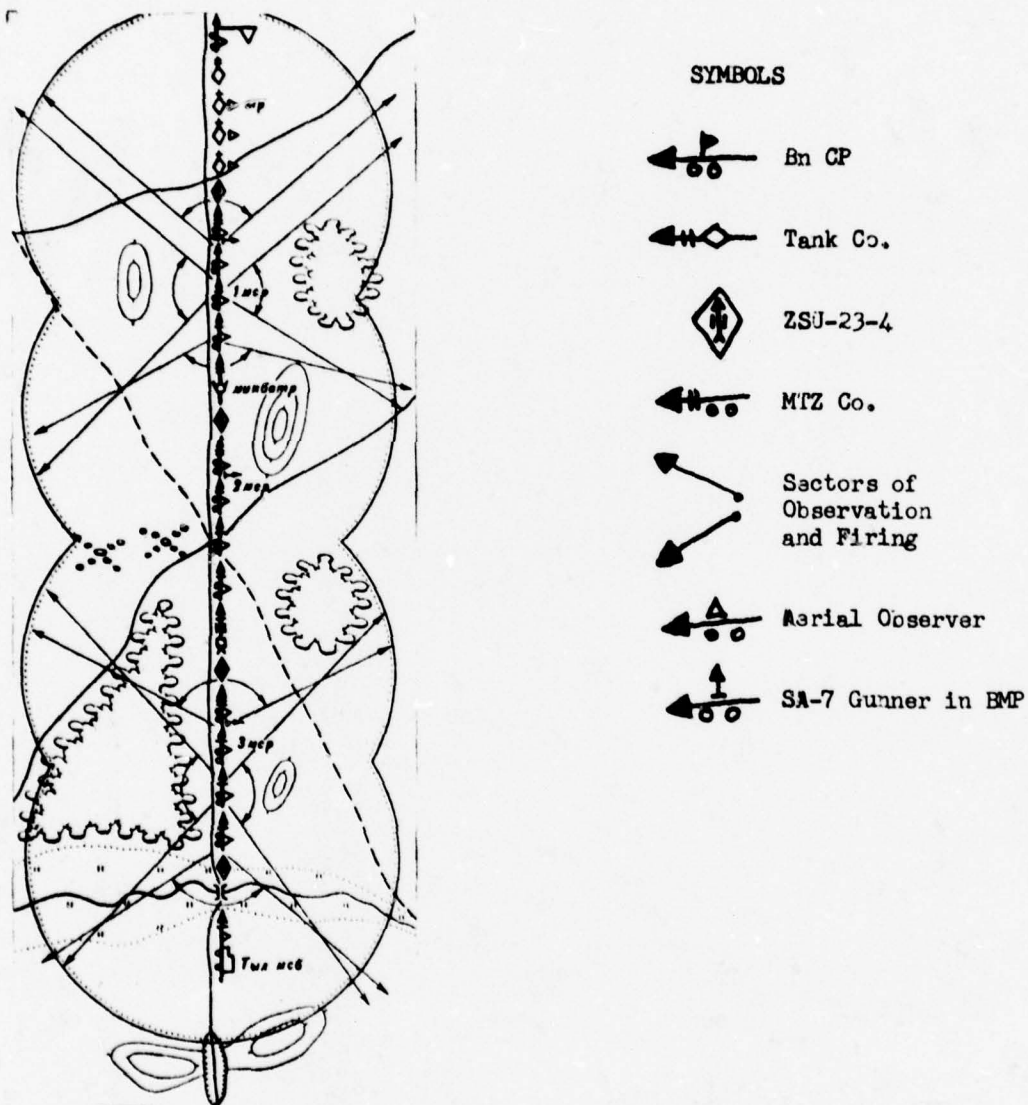
At night, aircraft will only be engaged on order of the battalion or company commander. Strict light discipline will be enforced and all lights (sometimes including night vision devices) will be turned off when aircraft are in the vicinity of the column.

While conducting a march with the expectation of meeting the enemy at a predetermined location (approach march), the MRB normally employs a march formation as shown in Figure 6. The ZSU-23-4 battery's mounts are distributed through the column at intervals of 500-700 meters. This enables the AAA weapons not only to provide air defense coverage of the entire column but also to ensure that once the battalion deploys into its combat formation and launches the assault the antiaircraft unit will be able to rapidly assume the appropriate combat formation to support the attack. The battery command post follows the battalion command and observation post (Bulatov and Poliakov, 1976:86).

Procedures for surveillance, communications and signal, fire control and sectors of responsibility are the same as for a march in expectation of meeting the enemy at an undetermined location. It is assumed that a battalion in the approach march must launch its attack at a predetermined time, consequently, the battalion will most likely continue to move while under air attack even should concealment be available. The ZSU-23-4 fire units will engage aerial targets on the move.



Figure 6. Air Defense of a Motorized Rifle Battalion in Approach March Column



(Not Drawn to Scale)

SOURCE: Bulatov and Poliakov, 1976:87

## AIR DEFENSE DURING THE ASSAULT

Although the formations and combat activities of the MRB differ somewhat during the meeting engagement and the attack from the march, air defense procedures and tactical formations differ relatively little. The mission of supporting air defense in both these circumstances remains to protect the combat power of the battalion and prevent interference from aerial fires in the accomplishment of the battalion's mission. Therefore, we shall examine the tactical deployment of air defense in the attack from the march.

Upon completion of its approach march, the battalion deploys into its combat formation for the assault. The assault may be conducted with the infantrymen mounted in the BMPs or, if the defense is firmly established and heavily protected with antitank weapons, the infantrymen may dismount to attack. Should the attack be conducted with the infantrymen remaining in the BMPs, the ZSU-23-4s will form a line of platoons with each platoon supporting an attacking "first echelon" motorized rifle company (Figure 7). The ZSU-23-4 platoons will be located approximately 400 meters behind the tanks or BMPs. This distance is optimal, since it provides for antiaircraft fire far forward over the enemy positions (Soviet authors are certain that attacking fire support helicopters will launch their antitank guided missiles, ATGMs, while over the positions of their own troops (Gatskov, 1973:66) or from the flanks. Moreover, this distance increases the survivability of the antiaircraft weapon systems from enemy small arms fire. The distance between mounts is not standard and is dependent upon the width of the battalion's sector, however a separation of 150-200 meters is recommended for safety and control purposes. The battery command post follows behind the line of platoons at the range of direct visibility but no farther than 200 meters to the rear (Todurov, 1976:82).

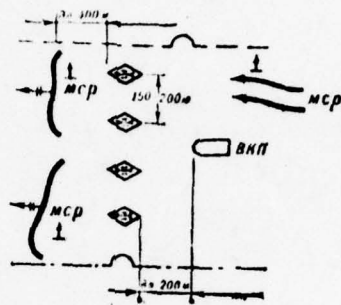
The SA-7 gunners remain with the BMP of the company commander. They fire directly from the vehicle. It does not appear likely, however, that the SA-7 can be fired from the deck of a rapidly moving BMP advancing over broken ground or from the troop hatch for that matter. The literature simply states the SA-7 gunners "fire either directly from the infantry combat vehicles, armored personnel carriers or motor vehicles" with no amplification (Todurov, 1976:82). It is more likely that they would fire from short halts in the same manner as when firing the BMP's 73mm smooth bore gun.

The motorized rifle company following in the battalion's second echelon is given an air defense role until such time as it is committed. This company is more likely to engage those aerial targets that have penetrated over the battalion's formation or along the flanks. This is primarily due to the range limitations of the infantry machineguns and automatic weapons.

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\*Although the ZSU-23-4 mount is a lightly armored vehicle (modified PT-76 chassis) and the crew is protected from small arms fire, the radar antenna is particularly vulnerable. Soviet authors continually expressed concern that the ZSU-23-4 mounts remain beyond small arms range.

Figure 7. Air Defense of a Motorized Rifle Battalion in a Mounted Assault



(Not Drawn to Scale)

SOURCE: Todurov, 1976:82

#### SYMBOLS



ZSU-23-4



SA-7 Section



Motorized Rifle Co.



Alternate Command Post

While advancing, the maximum range at which aerial targets may be engaged, according to Soviet sources, is 700-800 meters (Tikhomirov, 1977:8).

Sectors of responsibility are not assigned, at least not in the same sense as they were in the march column. The ZSU-23-4 platoons engage targets posing a threat to the companies they are protecting. Fires are controlled by the battery commander, but this control is slightly looser than in the waiting area or on the march. Fire control is exercised by means of previously issued instructions and the battery commander will generally only give orders to shift fires on targets the platoon or mount commanders may not have detected or to mass fires on targets presenting a greater threat. SA-7 gunners engage targets on order of the company commander and sometimes on order of platoon commanders.

Aerial observers are appointed on each ZSU-23-4, at each company command post (this function is performed by the SA-7 gunners) and at the battalion command and observation post. The air warning is given by radio and colored flares.

If the battalion is to attack on foot, the infantrymen will dismount from the BMPs and attack in a line of skirmishers behind the tanks. The tactical formation and fire control procedures for the ZSU-23-4 battery are the same as for the mounted attack (i.e. a line of mounts 400 meters behind the tanks).

The SA-7 gunners dismount with their companies and advance in a line behind the line of skirmishers. They are located immediately behind the company commander and, depending upon the width of the company's front, are separated by approximately 30 meters. The company commander indicates which targets are to be engaged and directs their fire with voice commands or hand and arm signals. The SA-7 gunners will fire on targets from the short halt and then return to their positions in the formation with a dash (Bulatov and Poliakov, 1976:87). The preferred method for engaging single targets or small groupings of aircraft/helicopters is salvo fire (i.e. fire by more than one gunner against the same target without waiting for the results of the first missile). Multiple targets are engaged with one missile each (Gatsolaev, 1973:69).

Despite the fact that ammunition and missile consumption is anticipated to be high during the offensive, the literature contains relatively little discussion concerning resupply procedures. There is no mention whatsoever of resupply of missiles to SA-7 gunners.

In addition to the 2,000 rounds carried in the ZSU-23-4 itself, additional 23mm ammunition is carried by organic vehicles which follow approximately 1,500-2,000 meters behind the battery. Reloading is normally accomplished at night, during periods of reduced visibility or when enemy air activity is light (Gatsolaev, 1974:115).

After the battalion's objectives for the assault have been secured and if the pursuit is to be conducted, the battalion reforms into a march column. The tactical formation will be the same as for conducting the march



in anticipation of meeting the enemy at an undetermined location. Air defense formations and procedures are the same as during that type of march.

#### THE ATTACK FROM POSITIONS IN DIRECT CONTACT WITH THE ENEMY

Although Soviet tacticians express a preference for the attack from the march, conditions may arise where it is necessary to initiate the attack from positions in direct contact with the enemy. These may be the shift from the defense to the offense, unsuitable terrain conditions, a regrouping of forces or narrowing of zones or the exploiting of the attack of a neighboring unit. The attack from positions in direct contact combines the assault of units switching over from the defense with the simultaneous assault of units (primarily tank) attacking from the approach march (Reznichenko, 1966:256-257).

A motorized rifle battalion participating in such an attack will have been previously reinforced with an antiaircraft (ZSU-23-4) unit which will have been providing air defense coverage during the battalion's defensive operations.\* The AAA unit remains in those firing positions it had occupied in the defense until the assault is well underway and then it assumes the tactical formation previously described for the dismounted attack. SA-7 gunners advance with their companies behind the attack formation.

Procedures for surveillance, air warning and fire control are the same as for the dismounted attack.

### CHAPTER III

#### AIR DEFENSE OF THE MOTORIZED RIFLE BATTALION IN THE DEFENSE

According to the Soviet view, the defense is a forced and always temporary form of combat operation adopted when the attack is not possible; however, the defense should not be viewed as a passive activity. The defense is designed to inflict maximum damage and, if possible, a decisive defeat upon the attacking enemy (Garbuz et al, 1972:199). Air defense activities in the defense reflect this aggressive viewpoint. They are active, coordinated and maximized to inflict the greatest damage.

Unlike the offense, where a totally integrated system of air defense cannot always be maintained due to the dynamic and fluid situation, the key component in the defense is the total integration of all forms of air defense protection. These include the fighter/interceptors of frontal aviation, the long-range SAM air defense systems, attached self-propelled AAA units, organic SA-7 SAMs and the fires of infantry machineguns and

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\*See Chapter III for the air defense procedures and tactical formations of the motorized rifle battalion in the defense.

determined maneuvers, launch colored rockets, or turn on navigation or landing lights to confirm their identity for ground observers (Grishin, 1974:94).

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automatic weapons. All of these weapons are integrated into a formidable, overlapping, all-altitude air defense umbrella over the defending MRB. This system is organized and controlled by the ground force commander. Information concerning the coverage and sectors of weapons systems not under his immediate control is provided by his next higher commander and is a component of the operations order.

The MRB may be assigned the mission of defending in the regiment's first or second echelon and on the main or secondary axis. Battalions defending in the first echelon are normally reinforced with tanks, antitank weapons and antiaircraft weapons. Battalions on a secondary axis receive less reinforcement than those on the main axis (Garbuz et al, 1972:211-217). In the first echelon the battalion generally defends in one echelon with a front of up to 5 km. The defense is organized around platoon and company strong points which provide for all-around defense. Gaps between strong points are covered by tanks and antitank weapons.

For the purpose of this study we shall only examine the air defense of a battalion defending in the first echelon on the main axis. These battalions would be subjected to the greatest air threat and would, consequently, more fully demonstrate the procedures taken to counter it.

The basis of the protection of the MRB in the defense is the integration of air defense coverage provided by the AAA and SAM weapons of higher command echelons with those assigned and attached to the battalion. This is accomplished by the establishment of demarcation lines in both the vertical and horizontal plane. Within the limits of the area established by these demarcation lines (which would, if extended fully, resemble a half sphere) designated weapon systems have priority of engagement. Shorter range systems cover the battalion's immediate defensive area and longer range systems project farther out and at higher altitudes. Generally, the battalion is responsible for the destruction of aircraft and helicopters operating within a half sphere extending to an altitude of 1200 meters and out to the maximum range of the ZSU-23-4 (2,500 meters). This area is further delimited to provide areas for engagement with infantry weapons (Sharapov, 1972:74). In the defense, this range is 1,000 meters (Tikhomirov, 1977:8). This does not preclude other air defense weapons from attacking within this zone nor is the battalion prohibited from attacking targets outside of it, although interceptor aircraft, as a rule, will not enter the zone of ground based air defense fires, unless there is no other alternative (Gatsolaev, 1974:56).

Sectors of responsibility for aerial observation and firing will be designated by the battalion commander. The boundaries of sectors are oriented on distinguishable terrain features and overlap. Primary target lines (PTL) are also assigned within sectors along routes of probable air attack. The deployment of the antiaircraft battery is weighted towards the most threatening approaches into the defensive area. The battery is deployed by platoons separated by not more than 1,000 meters. SA-7 gunners are deployed within the strong points of their companies with the apex of their triangle oriented on the assigned PTL.

Greater latitude in the selection of firing positions for the air defense weapons is permitted in the defense, consequently, these positions are selected with a view to maximizing the target detection capability of the ZSU-23-4 radars. Gaps in the radar coverage due to terrain masking are covered by aerial observers located on commanding terrain features. Aerial observers are designated at each platoon and company command post, ZSU-23-4 and SA-7 firing position, and at the battalion command and observation post.

Soviet writers expect a high level of air activity to precede and accompany any attack on a defensive position. Therefore, to preclude the enemy from gaining intelligence as to the disposition of the air defense support, the fire units do not remain static. There will be considerable shifting from one firing position to another. As a minimum, primary, alternate and reserve firing positions are selected and prepared in advance for each ZSU-23-4 and SA-7. Alternate firing positions may be up to 500 meters from the primary positions (Mikhailov, 1972:19). Firing positions are shifted and occupied on order of the battalion commander. Movement is generally accomplished at night and during periods of reduced visibility to further ensure security.

As an additional security measure to conceal the exact nature of the air defense deployment, duty weapons are designated in each antiaircraft platoon and SA-7 section. Prior to the enemy's ground attack, only duty weapons are permitted to engage single aircraft approaching the battalion's defensive zone and then only from temporary firing positions which are separate from those discussed above. After firing the antiaircraft mount (SA-7 gunner) immediately relocates to a new, preselected firing position (Gatsolaev, 1974:131).

To further enhance the air defense coverage and to achieve surprise, the Soviet Union has expanded on a tactic they employed in World War II: the use of antiaircraft ambushes and roving antiaircraft guns. At least a portion of every publication surveyed was devoted to a discussion of the advantages and effectiveness of these tactics. "An antiaircraft ambush implies the action of separate firing platoons, guns or gun mounts aimed at delivering a surprise attack on the enemy aircraft in the direction he expects least of all" (Subbotin, 1974:81). Antiaircraft ambushes may also be established using a section or more of SA-7 gunners. The advantage of an antiaircraft ambush is that it extends the air defense coverage of a unit in the defense. A portion of the air defense assets is sent out in an ambush role along a likely avenue of air attack to engage helicopters capable of launching ATGMs while outside the range of the air defense weapons located in the defensive position. The unexpectedness of the attack from ambush is considered an effective means of discouraging low-level attacks on the defensive position. The success of an ambush depends upon secrecy, concealment and camouflage. "An antiaircraft ambush must not show any activity till the enemy plane (helicopter) detected in the specified direction approaches the zone of effective fire. Should an ambush be detected, it must leave its position" (Subbotin, 1974:82). Antiaircraft weapons conducting ambushes will return to the main defensive position



at a predetermined time or on-call, but not later than prior to the enemy's ground attack.

Roving AAA guns, on the other hand, actively seek out encounters with enemy aircraft. These guns maneuver outside the main defensive position and respond rapidly to any change in the air situation by immediately moving to the most threatened sector. Several temporary firing positions are selected in advance and the roving gun shifts from one to another. Roving guns engage any aircraft/helicopter within range. After firing, they immediately move to a new location. The active nature and continual shifting of positions is designed to confuse the enemy and conceal the true size and deployment of the air defense system. The effectiveness of roving antiaircraft guns depends upon the accuracy and timeliness of aerial reconnaissance information and, therefore, special efforts will be made to ensure that reconnaissance data from all available means reaches the roving gun. Roving guns are also recalled prior to the enemy ground attack.

Figure 8 is a presentation of the air defense deployment for a MRB in the defense including ambushes and roving guns.

#### CHAPTER IV

##### AIR DEFENSE DURING RIVER CROSSING OPERATIONS

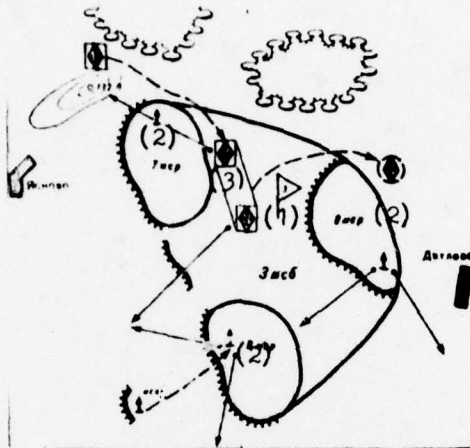
Discussions of river crossing operations are encountered so frequently in Soviet military literature and the tactical activities of air defense fire units differ so greatly from those described for offensive and defensive operations that it is appropriate to include air defense operations during river crossings as a separate category. Forcing river barriers, of course, is an extension of offensive operations, but the capability of aircraft and helicopters to delay or stop advancing troops at water obstacles has prompted the development of special procedures to protect river crossings.

The MRB will, as a rule, force river barriers from the march while maintaining a high rate of advance. The importance of speed in overcoming the water obstacle is continually emphasized. Consequently, preparations for a river crossing are begun well in advance. The river is reconnoitered and crossing sites and missions are assigned when the unit is still some distance from the obstacle. If fords or bridges are available, the entire battalion crosses immediately in march formation. If not, the amphibious motorized rifle companies swim across supported by the fires of tanks and artillery deployed on the near shore. Some of the tanks will cross on the river bottom using snorkelling equipment. Multiple crossing sites will routinely be used (Reznichenko, 1966:309).

The motorized rifle battalion will approach the designated crossing area in the same formation as for conducting the march with the expectation of meeting the enemy at an undetermined location (See Chapter II). The tactical formations and position in the column of the antiaircraft fire units and SA-7 gunners as well as the procedures for surveillance, reporting



Figure 8. Air Defense of a Motorized Rifle Battalion  
in the Defense



(Not Drawn to Scale)

SOURCE: Mikhailov, 1973:79

#### LEGEND

1. Battalion Command and Observation Post
2. Company Defensive Strong Points
3. Antiaircraft Battery Primary Firing Positions

#### SYMBOLS



ZSU-23-4 Platoon in Temporary Firing Position



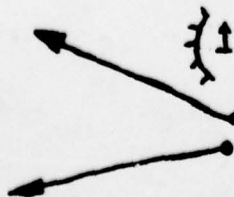
ZSU-23-4 Fire Unit as Roving Gun



SA-7 Section in Firing Position



SA-7 in Ambush



Sector of Responsibility for Firing and Observation

and communications are as previously described. While approaching the crossing site, one ZSU-23-4 in each platoon and one SA-7 gunner in each section is at Readiness Condition No. 1, but when the lead company reaches the water barrier or if air targets have been detected, all air defense weapons assume that readiness condition.

Initially, during the forcing of a river, the ZSU-23-4 mounts remain some distance back from the water's edge because of their vulnerability to enemy fires from the far shore. They will take up firing positions 300-500 meters from the river and are normally assigned the mission of protecting the artillery and tanks in the sealing area (that location selected for the readying of tanks to snorkel across the river). From these firing positions they can also cover the motorized rifle companies which are swimming the river. Because multiple crossing sites will be used, the area to be covered may be rather large. The ZSU-23-4 battery will, therefore, be deployed in platoons with an interval between platoons of 1,000-1,500 meters (Mikhailov, 1976:28-29). Overlapping sectors of responsibility for surveillance and firing will be assigned paying particular attention to the flanks (Popov, 1974:84).

It appears that roving guns will find widespread use in river crossing operations and they will be detailed to operate along the flanks of the battalion (Subbotin, 1977:19). In a river crossing the battalion's flanks will be open with respect to the river's course (i.e. they will be perpendicular to the river), and as the river itself is considered to be the most dangerous low-altitude approach and the one most likely to be used by helicopters attacking the crossing forces, will be vulnerable. Consequently, the use of roving guns not only extends the coverage of the air defense system but places fire units on the most dangerous approach at a distance that brings helicopters armed with ATGMs within range.

The activities of the SA-7 gunners are more diverse during river crossing operations. Depending upon the level of air activity and the rate of advance, they may either cross the river with their own companies or be assigned missions on the near or far bank by the battalion commander. The SA-7 gunners of the lead motorized rifle company will likely cross with their parent company and establish temporary firing positions on the far bank with the mission of protecting the bridgehead. While crossing, they will engage targets from the swimming BMPs (Popov, 1974:84).

A portion of the SA-7 gunners from the remaining companies may be united into groups and assigned missions on the near shore under battalion control. These missions include covering the crossing site, tank sealing areas, bridges and establishing antiaircraft ambushes. While covering the crossing sites, SA-7 gunners occupy firing positions on islands, shoals, dams and the river bank itself. Ambushes are established along threatened flanks using islands or projections of the river bank as firing positions. Control of SA-7 gunners performing battalion missions on the near bank is centralized (Popov, 1974:84).

Once the motorized rifle companies have secured positions on the far bank and the threat of direct fire is diminished, the ZSU-23-4 fire units

shift their firing positions to the waterline. Only one mount will be moving at a time, the others being prepared to engage targets. From the bank, the ZSU-23-4 fire units extend their coverage as far as possible over the motorized riflemen on the far shore and cover the crossing of tanks and heavy equipment. As soon as ferries are put into operation, the ZSU-23-4s cross the river. The consensus among Soviet authors is that the ZSU-23-4s must cross as soon as possible, together with the tanks not after them. The recommended procedure is that the first vehicle to cross on a ferry should be a ZSU-23-4 which occupies a firing position as close as possible to the exit point. This fire unit in conjunction with those still on the near shore cover the crossing of the tanks. The next two ZSU-23-4 fire units to cross deploy behind the motorized rifle companies which are developing the bridgehead. After the last tanks have crossed, the remaining ZSU-23-4 crosses and the reunited platoon deploys to cover its supported company or assumes its place in the column if the march is to be continued (Gatsolaev, 1974:115).

In river crossing operations, ammunition resupply becomes of vital importance. Immediately prior to crossing the river ZSU-23-4 fire units take on reserves of ammunition. Moreover, unlike the offense where resupply vehicles follow the ZSU-23-4s at a distance of up to 2 km, during river crossings, the ammunition resupply vehicles cross simultaneously with the ZSU-23-4s. Commanders are cautioned that under no circumstances should the weapons and their ammunition resupply be on opposite sides of the river (Gatsolaev, 1974:115).

SA-7 gunners that had been detached for battalion directed missions rejoin their parent companies as soon as possible after the battalion has completed the crossing.

If a tactically significant crossing site has been seized, the ZSU-23-4 battery may be detached from the motorized rifle battalion and assigned the mission of protecting the crossing site or bridging operations. The battery deploys in platoons with one platoon occupying firing positions on each side of the river. SA-7 gunners, when available, deploy to establish antiaircraft ambushes thereby extending the air defense coverage of the crossing site. The use of the highly mobile ZSU-23-4 fire units to protect crossings or bridges is temporary and other antiaircraft means should replace them as soon as possible (Popov, 1974:85).

## CHAPTER V

### SUMMARY AND CONCLUSIONS

In the last decade the Soviet Union has developed and fielded an interrelated series of new air defense weapon systems designed to defend the airspace over the maneuver forces. This rapid and comprehensive weapon systems program seemingly was in response to the ascendancy of air power which had become manifest in the late 1960's. It appears that having perceived an imbalance between Western attack aircraft and helicopters and the means to defend against them, Soviet military planners embarked upon a program to expand and improve ground-based tactical air defense systems.



New air defense weapons, each designed to protect a specific portion of the battlefield, have appeared regularly. Moreover, tactical mobility has been emphasized and has assumed significant importance. Thus, each new air defense weapon is as mobile as the maneuver force it protects, while at the same time, older, less mobile weapons are being replaced or withdrawn.

A mobile, ground-based air defense system, of course, is only as effective as the tactical principles with which it is employed. The Soviet Union has developed and is continuing to develop such a body of tactical doctrine. In accordance with this doctrine, the principles of "purposefulness", "coordination", "continuity", "maneuverability", and "surprise" are stressed and become the guiding force behind air defense tactical employment. Utilizing these principles, specific tactical procedures have been developed to support the forward cutting edge of the maneuver force during various forms of combat operations. A fairly comprehensive set of tactical employment procedures to support the motorized rifle battalion during the march, the offensive and the defense have been standardized and published in the Soviet military press. Also, specific procedures have been developed for operations under special circumstances (e.g. river crossings etc.).

Soviet military writings strongly indicate that their tactical doctrine intends to maximize upon the high battlefield mobility of Soviet air defense systems. While protecting a maneuver force either in the offense or the defense, air defense fire units will constantly shift positions and the defense will never be static. "Roving guns" and "ambushes" will be widely used to extend the coverage but primarily to achieve surprise. Judging from the sheer quantity of material pertaining to "roving guns" and "ambushes", it is obvious that Soviet military writers consider this tactic as the most effective means of countering low-level helicopter attacks. A constantly shifting defense augmented by "roving guns" and "ambushes" significantly compounds the problem of detecting air defense fire units on the battlefield. If NATO aircraft and helicopters are to blunt the thrust of a Soviet attacking force, then timely information as to the disposition of the protecting air defense forces will be urgently required. Where they were will not be sufficient.



# SELECTED BIBLIOGRAPHY

Adamov, K. Colonel  
1975

"A Chto Esli Srednii Kalibr?" (And What If Medium Calibre?) Voennyi Vestnik 3 (March): 93-95.

Bahnsen, John C. Colonel  
1977

"How To Kill A ZSU." United States Army Aviation Digest 11 (November): 2-3; 22-23.

Belov, M. Colonel  
1976

"Helicopters and Land Force Tactics." Soviet Military Review 12 (December): 22-24.

Borgart, Peter  
1977

"The Vulnerability of the Manned Airborne Weapon System. Part 1: Probability of Detection." International Defense Review 4 (August): 667-671.

1977a

"The Vulnerability of the Manned Airborne Weapon System. Part 2: Probability of a Kill." International Defense Review 5 (October): 860-866.

1977b

"The Vulnerability of the Manned Airborne Weapon System. Part 3: Influence on Tactics and Strategy." International Defense Review 6 (December): 1062-1066.

Bilatov, A. Colonel and  
Poliakov, I. Colonel  
1976

"Protivovozdushnaia Oborona v Batal'one." (Air Defense In A Battalion.) Voennyi Vestnik 7 (July): 84-88.

Bulyzhkin, S. Colonel  
1977

"Kompleksnoe Zaniatie S Zavitnoi Batareei." (Multi-Theme Exercise With A Antiaircraft Battery) Voennyi Vestnik 8 (August): 98-102.

Bystry, N. Colonel  
1975

"Helicopters Over The Battery." Soviet Military Review 1 (January): 28-29.

Chuvakin, N. Lieutenant Colonel and  
Logvinenko, B. Major  
1973

"Razvedka Vozdushnogo Protivnika Na Marshe." (Reconnaissance of the Air Enemy on the March.) Voennyi Vestnik 2 (February): 76-79.

CO D, 519th MI Bn.  
undtd

Operator's Manual BMP Armored Infantry  
Combat Vehicle. Aberdeen Proving Ground,  
Md: CO D, 519th MI Bn.

Crawford, Natalie W.  
1977

Low Level Attack of Armored Targets.  
Santa Monica, Ca: The Rand Corporation.

Dolbilov, V. Major  
1974

"S Tankistami Vo Vstrechnom Boiu." (With  
Tankmen in a Meeting Engagement.) Voennyi  
Vestnik 8 (August): 96-99.

Fossier, Mike W.  
1975

"The Role of SAM's in Tactical Warfare."  
Pp. 35-41 in Geoffrey Kemp, Robert L.  
Pfaltzgraff and Uri Ra'anani (eds.), The  
Other Arms Race. Lexington, Mass:  
Lexington Books.

Garbuz, G. I., Loza, D. F., and  
Sazonov, I. F.  
1972

Motostrelkovyi Batal'on V Boiu. (The  
Motorized Rifle Battalion in Batt. .)  
Moscow: Military Publisher of the  
Ministry of Defense USSR.

Gatsolaev, V. Lieutenant General  
1973

"Kogda V Vozdukh Vertolety." (When  
Helicopters Are In The Air.) Voennyi  
Vestnik 11 (November): 65-70.

1974

Zenitnye Podrazdeleniia V Boiu. (Anti-  
aircraft Subunits in Combat.) Moscow:  
Military Publisher of the Ministry of  
Defense USSR.

1974a

"When Helicopters Are In The Air."  
Soviet Military Review 9 (September):  
10-13.

Gray, Colin  
1977

"Soviet Tactical Airpower." Soviet Aero-  
space Almanac Air Force Magazine 3  
(March): 62-71.

Grishin, V. Colonel  
1974

"Vizual'naiia Razvedka I Opoznavanie Tselei."  
(Visual Reconnaissance and Identification  
of Targets.) Voennyi Vestnik 9 (September):  
94-96.

Kabulakhin, N. Lieutenant Colonel  
1977

"Pravil'no Ispol'zovat' Strelkov-Zenitchikov." (To Corrently Emplo. Anti-aircraft Gunners.) Voennyi Vestnik (July): 104-105.

Kuriukhin, M. Colonel  
1975

"Na Uchenii Streliali Mastera." (Experts Fired During the Exercise.) Voennyi Vestnik 3 (March): 86-91.

Kokhanov, V. Colonel  
1975

"Vstrechnyi Boi Motostrelkogo Batal'ons." (A Meeting Engagement of a Motorized Rifle Battalion.) Voennyi Vestnik 3 (March): 51-55.

Kutsenko, B. Lieutenant General  
1977

"Pervoi Raketoi, Pervoi Ochered'iy." (With the First Missile or First Burst.) Voennyi Vestnik 4 (April): 93-96.

Levchenko, P. General-Colonel  
1974

"Spetsial'naiia Podgotovka Voisk PVO SV: Ee Zadachi I Puti Ikh Reshenia." (Specialized Preparation of Ground Forces Air Defense Troops: Their Missions and the Means of Their Solution.) Voennyi Vestnik 4 (April): 74-78.

1976

"Protivovozdushnaia Oborona I Obshchevoishovoi Komandir." (Air Defense And The Combined Arms Commander.) Voennyi Vestnik 4 (April): 40-44.

Logvinenko, B. Major and  
Chuvakin, N. Lieutenant Colonel  
1974

"Reconnaissance of Enemy Air Targets." Soviet Military Review 1 (January): 22-23.

Meller, R.  
1977

"Europe's New Generation of Combat Aircraft Part 1: The Increasing Threat." Reprinted in International Defense Review Special Series-Combat Aircraft: 5-16.

Mikhailov, V. Colonel  
1972

"Air Defense of a Battalion." Soviet Military Review 3 (August): 18-19.

Mikhailov, V. Colonel  
1973

"Vzaimodeistvie Zenitchikov I Motostrelkov." (The Coordination of Antiaircraft Artillerymen and Motorized Riflemen.) Voennyi Vestnik 8 (August): 77-79.

1973a

"Covering the Motorized Infantry." Soviet Military Review 8 (August): 24-25.

1976

"Air Defense of an Advanced Detachment." Soviet Military Review 7 (July): 28-29.

Molchanov, N. Lieutenant Colonel  
1975

"Manevirovanie Zenitnykh Podrazdelenii." Maneuvering of Antiaircraft Subunits.) Voennyi Vestnik 6 (June): 84-86.

Nikulin, V. Senior Sergeant  
1976

"Po Nizkoletiaschim Tseliam." (Against Low-Flying Targets.) Znamenosets 4 (April): 29.

Pashkovskii, V. Colonel  
1977

"Takticheskoe Zaniatie So Vzvodom." (Tactical Exercise With a Platoon.) Voennyi Vestnik 1 (January): 77-82.

Pen'kov, G. Lieutenant Colonel  
1974

"Kak Bystree Otkryt' Ogon'." (How to More Quickly Open Fire.) Voennyi Vestnik 4 (April): 95-96.

Popov, E. Lieutenant Colonel  
1972

"Batareia ZSU Pri Forsirovanii." (Self-propelled Antiaircraft Battery During A Forced River Crossing.) Voennyi Vestnik 6 (June): 73-76.

1974

"PVO I Deistvie Zenitchikov Pri Forsirovanii." PVO and the Operations of Antiaircraft Artillerymen During a Forced River Crossing.) Voennyi Vestnik 5 (May): 83-86.

Pretty, R. T. (ed.)  
1977

JANE'S Weapon Systems 1977. London: Jane's Yearbooks.

Reznichenko, V. Major General (ed.)  
1966

Taktika. (Tactics) Leningrad: Military Publisher of the Ministry of Defense USSR.



Shadrin, V. Colonel  
1973

"Sviaz' V Batal'one Pri Perekhode K Oborone." (Communications in a Battalion During the Shift to the Defense.) Voennyi Vestnik 8 (August): 95-99.

Snarapov, N. Colonel  
1972

"Vzaimodeistvie Zenitnoi Batarei S Podrazdeleniiami MSB V Oborone." (Coordination of an Antiaircraft Battery With Motorized Rifle Battalion Subunits in the Defense.) Voennyi Vestnik 2 (February): 73-76.

Sidorenko, A. A. Colonel  
1970

Nastuplenie. (The Offensive) Moscow: Military Publisher of the Ministry of Defense USSR.

Skorik, B. Colonel  
1977

"V Tundre." (In the Tundra) Voennyi Vestnik 4 (April): 97-99.

Stralkov, V. Lieutenant Colonel  
1975

"Zenitnaia Samokhodnaia Ustanovka." (Self-Propelled Antiaircraft Gun) Znamenosets 7 (July): 16-17.

Subbotin, V. Colonel  
1971

"Prikryvaia Nastupaiushikh." (Protecting Those Who Are Advancing.) Voennyi Vestnik 8 (August): 83-85.

1974

"Koshuiuschie Zenitnye Podrazdelenia I Zasady." (Roving Antiaircraft Subunits and Ambushes.) Voennyi Vestnik 6 (June): 81-85.

1977

"Fighting Low Altitude Targets." Soviet Military Review 9 (September): 18-19.

Tikhomirov, N. Colonel  
1977

"Po Vertoletami Ogon'." (Fire Against Helicopters.) Znamenosets 2 (February): 8-9.

Timoshenko, A. Colonel and  
Saiko, V. Colonel  
1972

"V Ar'ergarde." (In the Rearguard.) Voennyi Vestnik 2 (February): 21-28.

Titov, L. Colonel and  
Shadrin, V. Colonel  
1973

"Sviaz' V Avangarde." (Communications in the Advance Guard.) Voennyi Vestnik 2 (February): 100-103.

Tobin, Gary  
1977

"The Viability of Offensive Air Support in the Next Decade." Reprinted in International Defense Review Special Series-Combat Aircraft: 51-54.

Todurov, R. Colonel  
1976

"Boevye Poriadki V Nastupatel'nom Boiu." (Combat Formations in Offensive Combat.) Voennyi Vestnik 1 (January): 81-84.

Tolkachev, V. Lieutenant Colonel and  
Vasin, A. Lieutenant Colonel  
1975

"Iz ZSU Po Vertoletam." (Against Helicopters from the ZSU) Voennyi Vestnik 3 (March): 91-93.

Ustanov, V. Colonel  
1974

"Noch' Umelym Ne Pomekha." (We Have No Hinderance at Night.) Voennyi Vestnik 2 (February): 96-99.

Vasilyev, S. Colonel  
1975

"Communications In An Offensive." Soviet Military Review 9 (September): 18-20.

Voronov, M. Major  
1973

"Sviaz' V. Batal'one Pri Nastuplenii S Knody." (Communications in a Battalion During the Attack From the March.) Voennyi Vestnik 5 (May): 86-90.

Wiener, Friedrich and  
Lewis, William J.  
1977

The Warsaw Pact Armies. Vienna: Carl Ueberreuter Publishers.

Zakharov, Iu. Colonel  
1977

"Pomnit' I O Vertoletakh." (Remember Helicopters Too.) Voennyi Vestnik 8 (August): 63-65.

Zimin, G. Marshal of Aviation  
1977

"O Nekotorykh Voprosakh Teorii Protivo-vozdushnoi Oborony." (Several Questions Concerning the Theory of Antiaircraft Defense.) Vestnik PVO 3 (March): 13-20.